



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

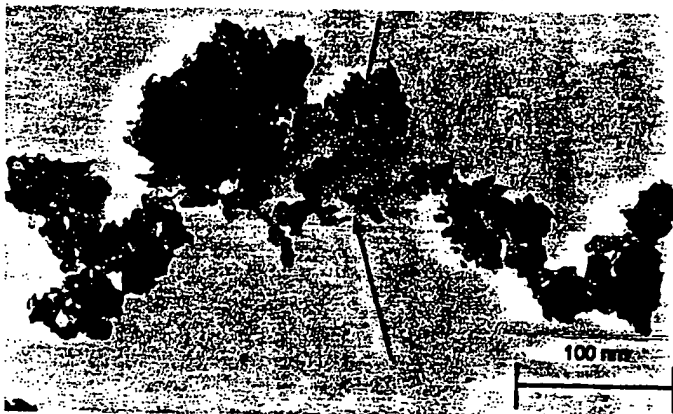
(51) International Patent Classification <sup>6</sup> : <b>A61L 27/00</b>		A3	(11) International Publication Number: <b>WO 98/16268</b>
			(43) International Publication Date: 23 April 1998 (23.04.98)
(21) International Application Number: PCT/US97/18631		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 16 October 1997 (16.10.97)			
(30) Priority Data: 08/732,016 16 October 1996 (16.10.96) US 08/729,344 16 October 1996 (16.10.96) US 08/729,343 16 October 1996 (16.10.96) US			
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(54) Title: METHOD OF PREPARING A POORLY CRYSTALLINE CALCIUM PHOSPHATE AND METHODS OF ITS USE

## (57) Abstract

The present invention provides a novel process for producing a calcium phosphate cement or filler which hardens in a temperature dependent fashion in association with an endothermic reaction. In the reaction a limited amount of water is mixed with dry calcium phosphate precursors to produce a hydrated precursor paste. Hardening of the paste occurs rapidly at body temperature and is accompanied by the conversion of one or more of the reactants to poorly crystalline apatitic calcium phosphate. The hardened cements, fillers, growth matrices, orthopedic and delivery devices of the invention are rapidly resorbable and stimulate hard tissue growth and healing. A composite material is provided including a strongly bioresorbable, poorly crystalline apatitic calcium phosphate composite and a supplementary material.

The supplementary material is in intimate contact with the hydroxyapatite material in an amount effective to impart a selected characteristic to the composite. The supplemental material may be biocompatible, bioresorbable or non-resorbable. A method for treating a bone defect also is provided by identifying a bone site suitable for receiving an implant, and introducing a strongly resorbable, poorly crystalline apatitic calcium phosphate at the implant site, whereby bone is formed at the implant site. The implant site may be a variety of sites, such as a tooth socket, non-union bone, bone prosthesis, an osteoporotic bone, an intervertebral space, an alveolar ridge or a bone fracture.



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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/18631

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61L27/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 037 639 A (TUNG MING S) 6 August 1991 cited in the application see claims; examples 1-5 ---	1-5
P,X	WO 96 36562 A (ETEX CORP) 21 November 1996 cited in the application see claims; examples ---	1-5
P,X	WO 97 17285 A (ETEX CORP) 15 May 1997 cited in the application see claims ---	1-5
Y	WO 92 02453 A (NORIAN CORP) 20 February 1992 see claims ---	1-89
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### \* Special categories of cited documents :

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- \*O\* document referring to an oral disclosure, use, exhibition or other means
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- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

29 May 1998

Date of mailing of the international search report

19. 06. 1998

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# INTERNATIONAL SEARCH REPORT

International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 94 02412 A (UNIV READING ;SIMKISS KENNETH (GB); TAYLOR MARINA GLORIA (GB)) 3 February 1994 see claims ---	1-89
Y	WO 94 04657 A (UNIV PENNSYLVANIA) 3 March 1994 see claims ---	1-89
A	YASUE T ET AL: "EFFECT OF ADSORPTION OF SUCCINIC ACID ON THE FORMATION OF AMORPHOUS CALCIUM PHOSPHATE" JOURNAL OF THE CERAMIC SOCIETY OF JAPAN, INTERNATIONAL EDITION, vol. 102, no. 12, 1 December 1994, pages 1125-1130, XP000505560 ---	1
A	WO 95 08319 A (AMERICAN DENTAL ASS) 30 March 1995 see claims & US 5 525 148 A cited in the application ---	1
A	EP 0 347 028 A (NORIAN CORP) 20 December 1989 see claims; examples & US 4 880 610 A cited in the application ---	1
A	EP 0 520 690 A (NITTA GELATIN KK) 30 December 1992 see claims; examples -----	1

## INTERNATIONAL SEARCH REPORT

I. national application No.  
PCT/US 97/18631

### Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
  
Although claims 67-83, 88-89 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

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Information on patent family members

International Application No

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